

REMARKS

The Office Action dated July 28, 2003 has been read and carefully considered and the present amendment submitted to make certain clarification to the claim language.

In that Office Action, claims 13 and 17 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirements. Claims 12-17 were further rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention and, specifically, the rejection was based on a lack of antecedents for "the working element" and for "the connection".

Next, claims 12-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Vainstock, U.S. Patent 4,962,676 in view of Nunes *et al*, U.S. Patent 5,964,124. Finally, claims 15-17 were rejected under 35 U.S.C. 103(a) as begin unpatentable over Vainstock.

Accordingly, in view of those rejections, applicant has cancelled claims 1-17 and is submitting new claims 18-23 herein in order to overcome the various Section 112 rejections and to better distinguish the present invention over the cited references.

As such, therefore, the term "working element" is stated in the beginning of the claim and is therefore believed to establish the antecedent basis for the later use of that element and in claim 21, the term "connection" has been referred to as "a kinematic connection". Thus, the new claims are submitted as overcoming the Section 112 rejection.

The new set of claims is supported in the original disclosure of this application as follows:

New claim 18:

- the presence of:

*a first movable link with first and second extremes, a second movable link with first and second extremes, first and second motors housed in the base and connected kinematically with first extremes of the first and second movable links...*

is supported in claim 12 filed in the previous amendment (as well as in the original description);

- (it continues):

*...by means of first and second articulations,*

is supported in the description "... to have an articulated union between the motors and the movable links in the kinematic train..." (section "Description of an Embodiment of the Invention", 6th paragraph);

- the presence of:

*a first guiding element which guides the first extreme of the first movable link along trajectories situated over a first straight line determined by said first guiding element,*

and

*a second guiding element which guides the first extreme of the second movable link along trajectories situated over a second straight line determined by said second guiding element...*

is supported in the description: "... to have an articulated union between the motors and the movable links in the kinematic train, it is possible to employ additional elements - **guide rails**" (section "Description of an Embodiment of the Invention", 6<sup>th</sup> paragraph); the more generic concept of "guidance" is repeatedly mentioned along the description;

- (it continues):

*... and being parallel to the first straight line,*

is supported in the description “...the movement of these extremes be over trajectories situated over parallel lines” (section “Description of an Embodiment of the Invention”, 4<sup>th</sup> paragraph);

- the presence of:

*a (third) articulation connecting kinematically (the second extremes) of the first and second movable links; said second extreme of the first movable link being furthermore connected to the working element,*

is supported repeatedly along the description (for instance, in the abstract: “A working element with two degrees of mobility, which, with the assistance of two motors manages to move two movable links, one of them acting on the working element, this is a method which is distinguished in the simultaneous action on a working element with the assistance of another movable link... the working element which is connected with the other extreme of the second movable link.” or in claim 12 filed in the prior Amendment, as well as in the original description, for instance, in the 1<sup>st</sup> paragraph of section “Description of an Embodiment of the Invention”);

- the presence of:

*a control algorithm for controlling speed and direction of each of the first extremes of the first and second movable links;*

is supported in the description (section “Detailed Description of the Invention”, last paragraph, as well as in the 4<sup>th</sup> and 5<sup>th</sup> paragraphs of the same section);

- in order to accomplish:

*a closed and therefore robust kinematic train formed by a triangle defined by the base and both first and second movable links which guides said working element with two degrees of mobility;*

which is supported in the description (section “Detailed Description of the Invention”, 3<sup>rd</sup> paragraph, as well as in the title);

All of this constitutes the preamble of new claim 18, according to the teachings of the prior art documents (Vainstock and Nunes).

- The characterizing (novel and inventive) part of new claim 18 contains the following:

*the first and second guiding elements are arranged making coincide the first and second straight lines determined by said guiding elements in a unique same straight line over which the trajectories of both first extremes of the first and second movable links are situated;*

which is supported in the description "...the movement of these extremes be over trajectories situated over parallel lines or over a same straight line." (section "Description of an Embodiment of the Invention", 4<sup>th</sup> paragraph);

- said arrangement of the first and second guiding elements having been provided in order to enable to:

*simplify the control algorithm of the first and second motors, since said arrangement of the guiding elements enables to move the working element **parallelly** to the base by simply acting the first and second motors with a same speed and direction (which is different and significantly advantageous with respect to the prior art), also enabling to move the working element perpendicularly to the base by acting the first and second motors with a same speed and opposite directions.*

which is fully supported in the description (section "Detailed Description of the Invention", 4<sup>th</sup>, 5<sup>th</sup> and last paragraphs).

New claim 19:

- the fact that:

*the working element (may be) connected to the second extremes of the first **and** second movable links by means of a fourth articulation*

is supported in the original description, for instance, "the connection between the working element and **both** movable links can be implemented by means of a ball or flat **articulation**" (2<sup>nd</sup> paragraph of section "Description of an Embodiment of the Invention");

New claim 20:

- the optional presence of:

*a spring: a first extreme of said spring being connected to the first movable link, a second extreme of said spring being connected to the second movable link, and an intermediate point of said spring being connected to the working element, in order to maintain angular position of the working element with respect to the base in absence of external forces acting on said working element;*

is supported in the description “In the device proposed, when there exists an articulated union between the working element and both movable links, there could be an additional spring (or springs) (12), one of its extremes connected with a movable link, the other extreme connected with the other link and its intermediate point connected with the working element. In such a case, if there are no external forces acting on the working element, the latter shall maintain its angular position with respect to the base.” (3<sup>rd</sup> paragraph of section “Description of an Embodiment of the Invention”);

New claim 21:

- the fact that:

*at least one kinematic connection selected from:*

*a kinematic connection between the first motor and the first extreme of the first movable link, and*

*a kinematic connection between the second motor and the first extreme of the second movable link,*

*(may be) self-blocking;*

is supported in claim 14 filed in the prior Amendment, as well as in the original description: “In the device proposed it is desirable (but not mandatory) to make a kinematic connection between at least one of the motors and the corresponding movable link with a self-blocking transmission (13)” (6th paragraph of section “Description of an Embodiment of the Invention”);

New claims 22 and 23:

- the optional presence of:  
*a plurality of working elements being connected kinematically to the same base, there being at least a first working element connected to first and second movable links whose lengths are larger than the lengths of first and second movable links corresponding to a second working element;*
  - and the optional presence of:  
*four working elements being connected kinematically to the same base:  
at a first side of the base there being: a first working element connected to long first and second movable links, and a second working element connected to short first and second movable links; and, at a second side of the base opposite to the first side of the base there being: a third working element connected to long first and second movable links, and a fourth working element connected to short first and second movable links.*
- is respectively supported in claims 15 and 16 filed in the prior Amendment (as well as in the description).

In view of the above, it is submitted that the new set of claims 18-23 are fully supported in, as well as directly and unambiguously derivable from the original disclosure of the present US application as originally filed, and therefore no new matter is being introduced into the present application.

Further to the arguments stated in the prior Amendment showing that technical solution disclosed in the present application was not be disclosed within Vainstock and/or Nunes, as requested by the examiner we herewith submit a new claim 18 that (apart from including in its preamble the already-known characteristics disclosed by Vainstock and Nunes) includes in its characterizing part the key technical structural difference (not in terms of the result to be achieved) with regard to the prior art, which is:

*“wherein the first and second guiding elements are arranged making coincide the first and*

*second straight lines (\*) determined by said guiding elements in a unique same straight line (\*) over which the trajectories of both first extremes of the first and second movable links are situated;"*

*\* (line over which the first extremes of the first and second movable links are guided along)*

since said arrangement of the first and second guiding elements is **structurally differently** than Vainstock which uses **two parallel** lines, and simplifies the control algorithm of the first and second motors, since the present arrangement allows movement of the working element parallelly to the base by simply activating the first and second motors with a same speed and direction while also enabling movement of the working element perpendicularly to the base by activating the first and second motors with a same speed and opposite directions.

The present arrangement is therefore different than that used in Vainstock (**two parallel** lines), where the working element can be moved perpendicularly to the base in a simple way, however, to move the working element parallelly to the base requires, with the Vainstock arrangement, to activate each of the motors with different and variable speeds, involving a significant complexity of the control algorithm.

It is therefore submitted that newly drafted claim 18 is patentable over Vainstock taken alone or in combination with Nunes *et al* and, accordingly, that the dependent claims 19-23 are also patentable for the same reasons. However, in further support of the patentability of the dependent claims, Applicant would like to again reiterate and reinforce the arguments submitted in the prior Amendment in support of those dependent claims, to wit:

The presence of springs maintains the position of the working element parallel to the base during the movement of the actuator if there are no external forces (movement of the robot's leg in the air).

When the actuator is working during the movement of the robot's body (the legs rest on the floor) the springs permit turning the working element with respect to the robot's body by means of the friction force and return the working element to the initial position in the moment of raising the robot's leg.

The solution consisting in using actuators in the same base provided with movable links with different length is not trivial because of the following reasons:

- On one hand, this solution has not been used before in walking-machines.
- On the other hand, this solution achieves an increment of the working zone of each of the robot's legs, which increases the speed of the robot.
- And most importantly, this solution increases the stability of the movement in a required direction, which is an absolutely novel feature, and proof of it can be found in the article "The Influence of Gravity on Trajectory Planning for Climbing Robots with Non-Rigid Legs" (Journal of Intelligent and Robotic Systems 35: 309-326, 2002. Kluwer Academic Publishers), which was submitted attached to the prior Amendment submitted in the present application. This effect is described in pages 322-324 of this article (legs with shorter movable links are more rigid, and legs with longer movable links are less rigid; their use in the same robot increases the stability of the movement in a required direction).

The connection between the base and the first ends of the movable links has been performed in a way that permits a movement in coincident trajectories on the same straight line; this technical solution (also enabling a reduction of the size of the robot) is not disclosed either in Vainstock nor Nunes *et al.*

After what has been described above, it becomes apparent that the devices disclosed in the references cited by the Examiner differ from the structure and design as now claimed in the present patent application and lack the advantages heretofore explained.

In the event that the Examiner still disagrees with the position of the Applicant and does not find the claims to be allowable, it is respectfully requested that the Examiner telephone Applicant's attorney to try to work out acceptable claim language to expedite the progress of this application.

Accordingly, it is submitted that the differentiating features mentioned above show that newly submitted claims 18-23 are patentable over the references cited in the present application

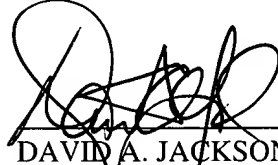


Serial No. 09/914,432

Group 3682

and it is submitted that all of the claims in the present application are allowable over the cited references and an allowance of the present application is respectfully solicited.

Respectfully submitted,

  
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